

Remote control for CPG based robots

Mid Term Presentation - 28 April 2010

Gabriel Cuendet

3rd year Bachelor in Electrical Engineering

Assistant : Alessandro Crespi

Current way to remote control the robots at Biorob



Gamepad

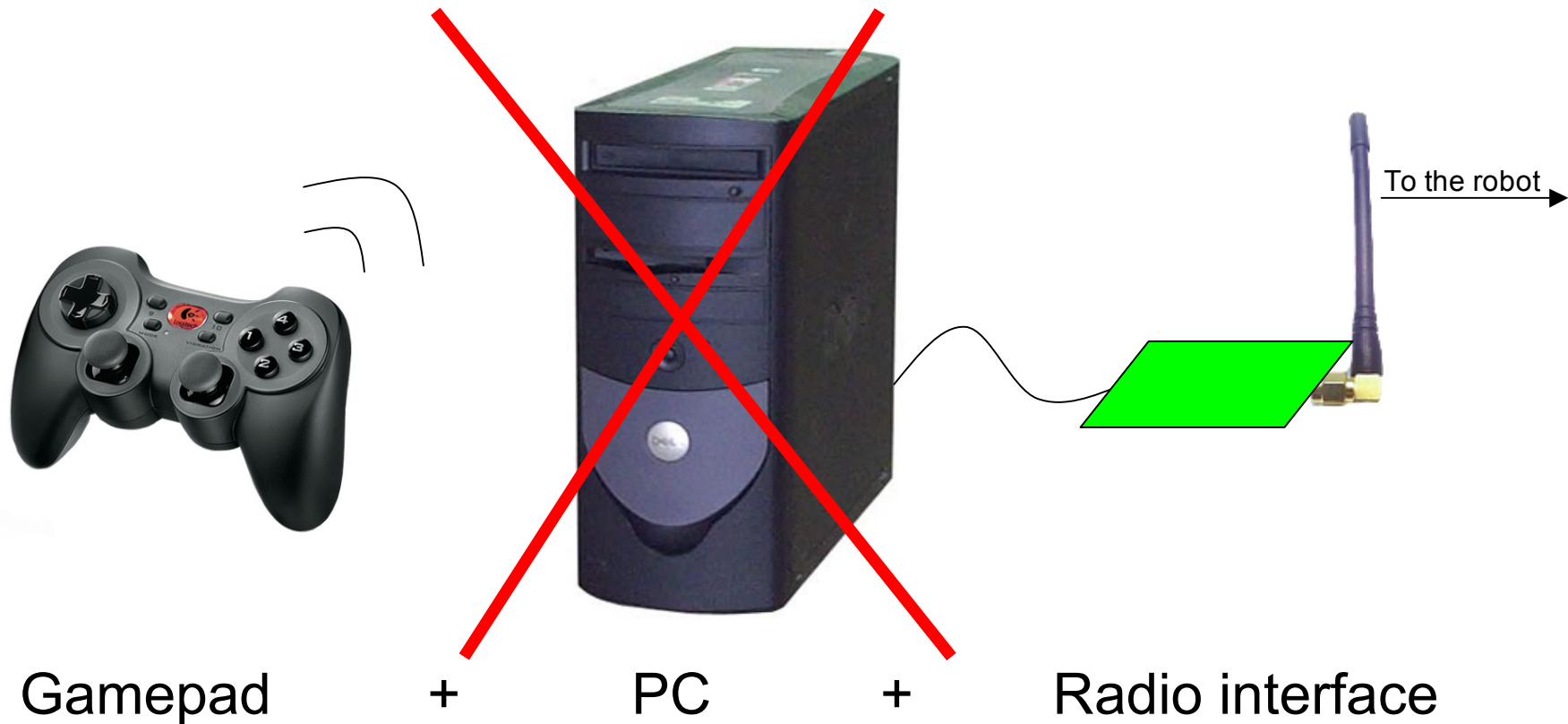
+

PC

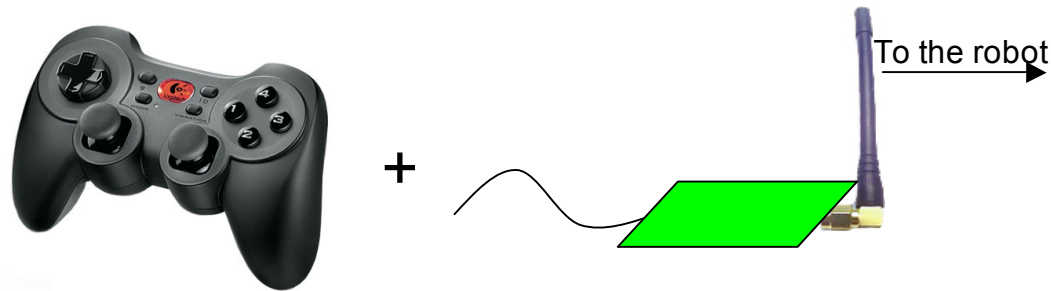
+

Radio interface

Goal of the project



Goal of the project : Hardware



- The device has to be as autonomous as possible



Controls + Battery + Radio interface

Task description

« The goal of this project is to develop a wireless remote control that communicates with a robot, which is controlled by a CPG . The electronics for the RF part aren't part of that project, since they are already designed. The remote control is able to configure a small number of locomotion parameters on the robot. It allows a user to interactively remote control the robot without needing a PC. »

Task description

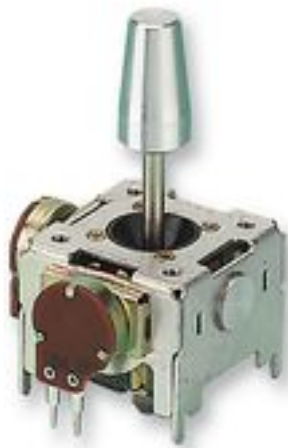
- Task-list :
 1. Review of the existent remote control using a PC and a radio interface. This radio interface is then included in the current project.
 2. Definition of the components needed to achieve interaction between the user and the robot.
 3. The PIC18F2580 development kit and a radio interface are available for test purpose.

Parts of the project

- Hardware ✓ (Dev. Version)
 - User interface
 - Battery management
- Software
 - User interface's PIC18F2580
- Housing and mechanical integration of the hardware

Hardware : User Interface

- Control the locomotion parameters
 - Joystick



Hersteller: MULTICOMP
Farnell Best.Nr.: 1148306
Herst.Bez.: STD-2603AR
RoHS-konform: ● Ja

Beschreibung

- JOYSTICK ZWEIACHS SELBSTZENTRIEREND
- Widerstand, Bahn:10kohm
- Track Taper:Linear
- Einstellungen, Zahl der:1
- Resistance Tolerance:± 20%
- Serie:STD
- Nennleistung:10mW
- Befestigungstyp:Through Hole
- Gruppen, Anzahl der:1
- Einstellungsart:Knob
- Widerstandselementtyp:Variable Rotary Joystick
- Anschlusstyp:Pins
- Breite, Frontplattenausbruch:26mm
- Breite/Weite:34mm
- Haltbarkeit, mechanisch:300000
- Länge/Höhe, Außen-:33mm
- Temperatur Arbeitsbereich:-10°C to +70°C
- Tiefe, Aussen:34mm
- Tiefe, hinter Frontplatte:20mm
- Widerstand:10kohm
- Widerstand, End-:10kohm
- Winkel, Dreh-, elektrisch:30°

Verfügbare Menge

Verfügbare Menge: 72
Preis für: 1 Stück
Mindestbestellmenge: 1
Bestellvielfaches: 1
Einzelpreis: SFr. 145.45 ✓

Menge

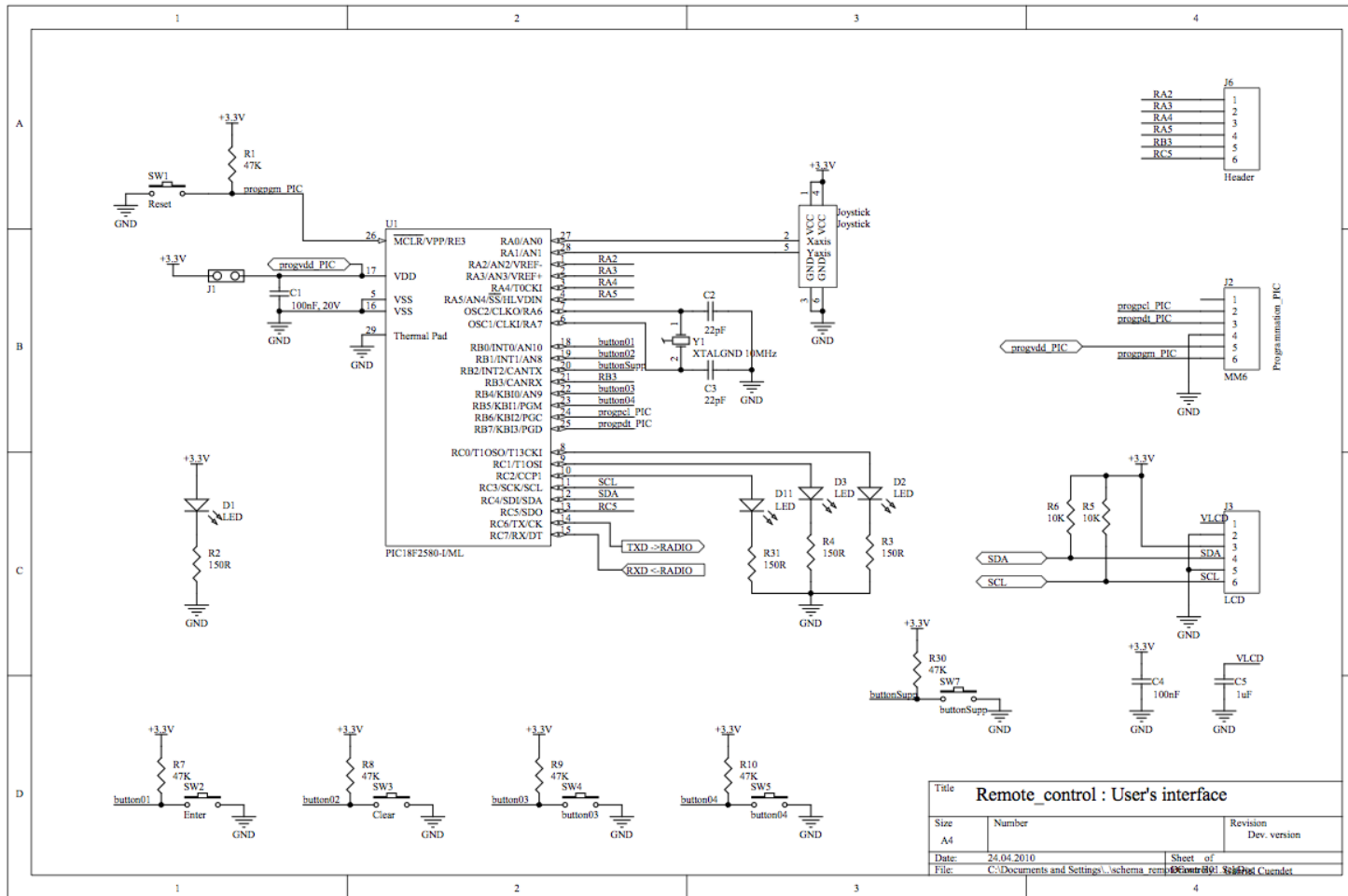
Preis

Menge	Preis
1 - 9	SFr. 145.45
10 - 49	SFr. 130.90
50+	SFr. 123.80

Hardware : User interface

- Control the locomotion parameters
 - Joystick
- Control other parameters
 - 4 Buttons : "Enter", "Cancel", "+", "-"
- Visual feedback
 - LEDs
 - LCD (2x16 characters, 3.3V, I2C)

Hardware : User interface

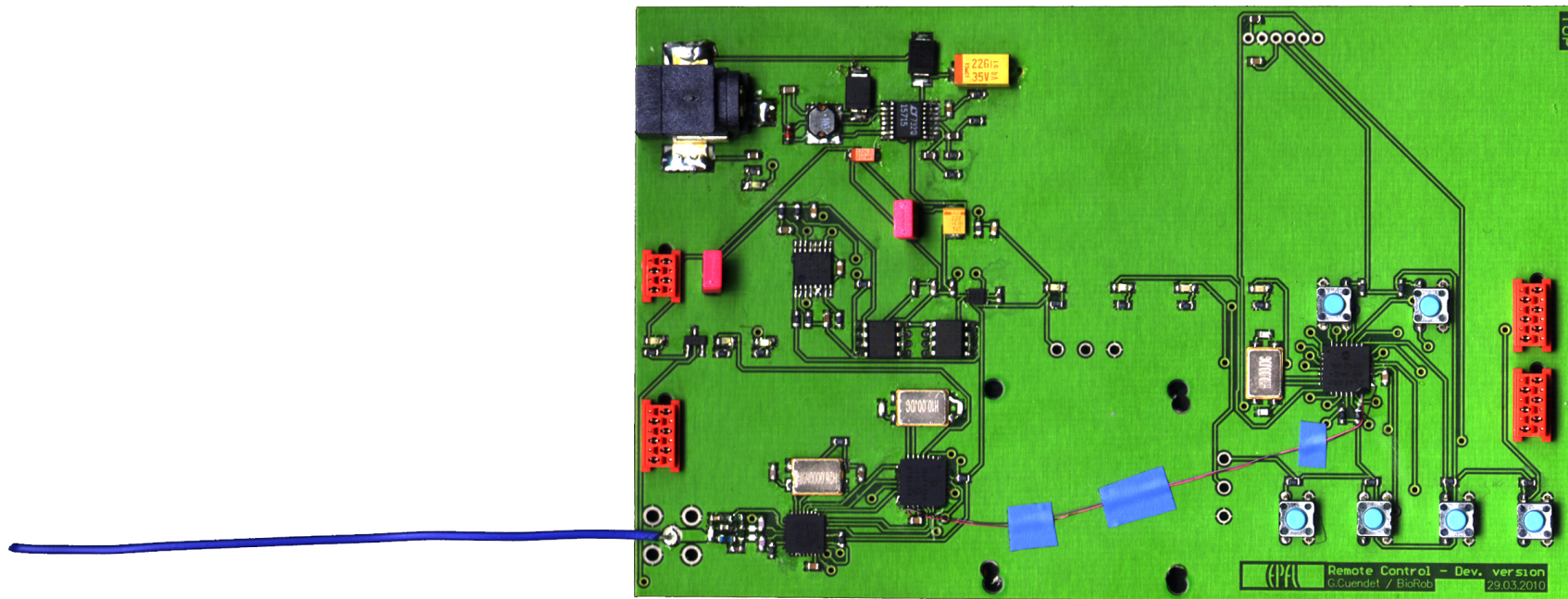


Hardware : Battery management

- **Battery charger**
LT1571-5 :
Input 8.2 - 26V (typ. 24V at Biorob)
- **Battery monitor and protection**
DS2764 :
Monitoring through I2C (voltage, temperature)
- **DC/DC Converter**
LTC3240 :
Battery voltage to 3.3V

Hardware : Dev. version Board

- First result : PCB



Parts of the project

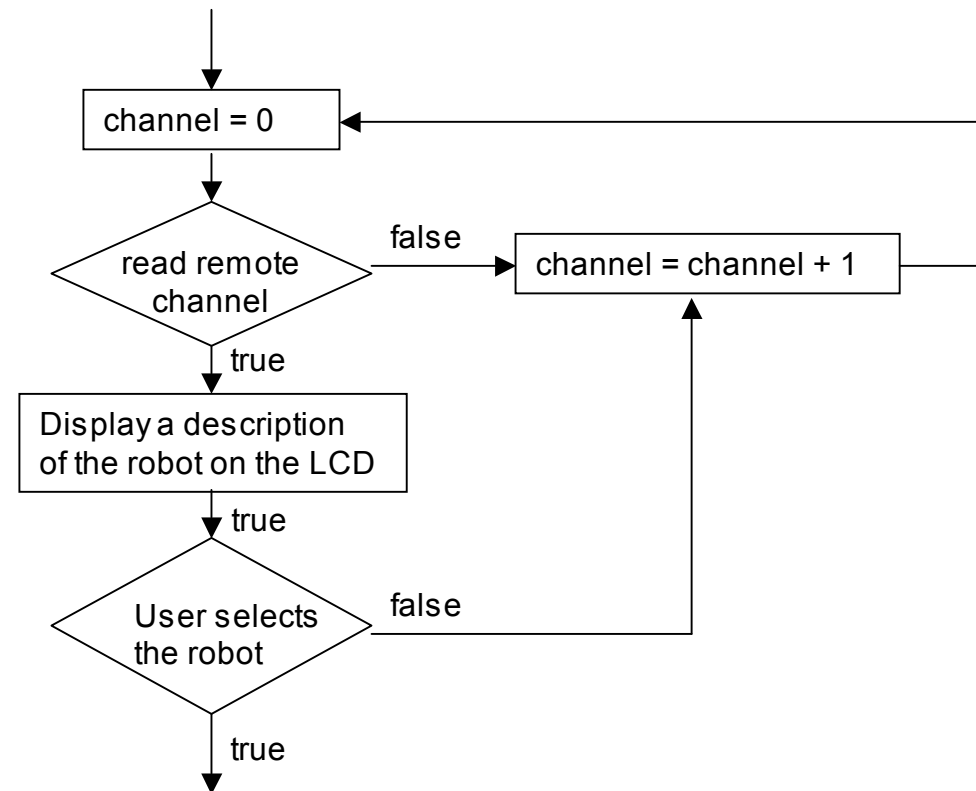
- Hardware ✓ (Dev. Version)
 - User interface
 - Battery management
- Software »» In progress...
 - User interface's PIC18F2580
- Housing and mechanical integration of the hardware

Software : getters and setters

- Register length : 1byte - 32 bytes
 - get_reg_b / set_reg_b 1byte
 - get_reg_w / set_reg_w 2byte
 - get_reg_dw / set_reg_dw 4 byte
 - get_reg_mb / set_reg_mb variable
- int1 get_reg_b (int16 address, int8* value)

Software : scan function

- Selection of the robot by the user
 - Scan the channels to identify all the available robots
 - The user selects the one he wants to control
- The function must be transparent for the robots

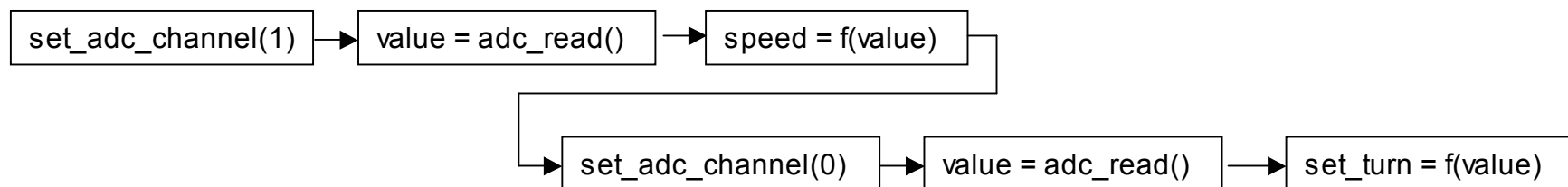


Software : first program

- RTCC (timer0) interrupt with prescaler

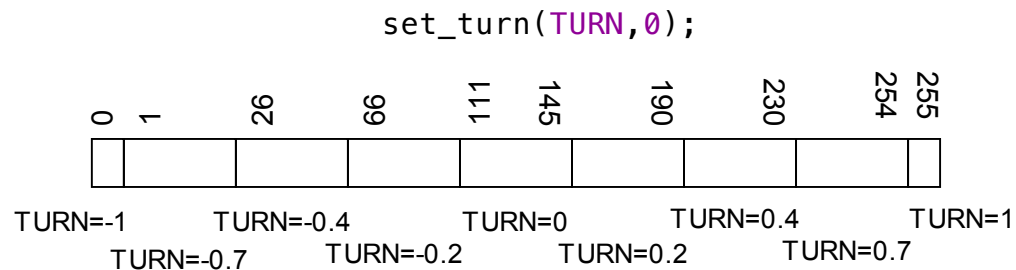
$$T_{\text{int}} = \frac{1}{2.5\text{MHz}} \cdot 4 \cdot 2^{16} \cong 105\text{ms}$$

- Analog to digital converter (8 bits) on pin A0 and A1 ("output" of the joystick)

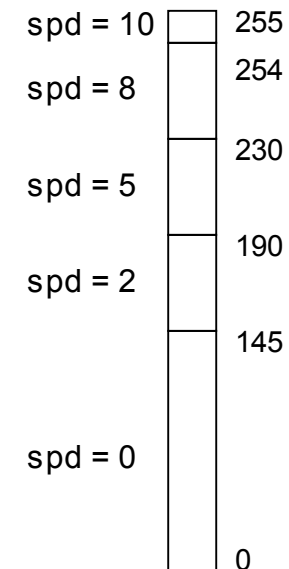


Software : first complete program

- Goal : to control the speed and direction of the Salamandra with the joystick



```
void set_turn(float turn_front, float turn_rear){
    set_reg_b(INTERNAL_REGB_TURN, (from_turn(turn_front) << 4)
              | (from_turn(turn_rear)));
}
```



```
ampl_b = 33.333333 + 2.666667 * spd;
ampl_l = ab;
freq_b = 0.5 + 0.08 * spd;
freq_l = 0.2 + 0.08 * s
```

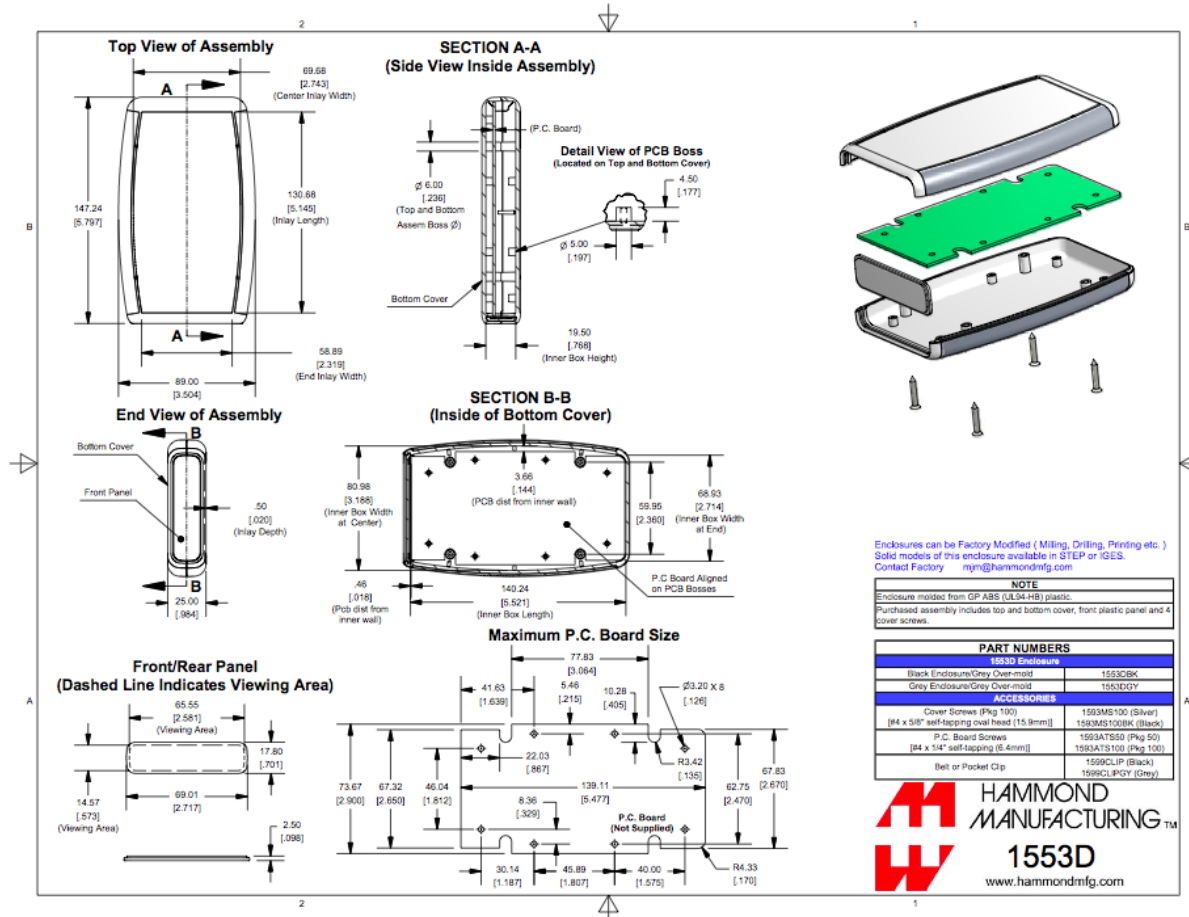
Parts of the project

- Hardware ✓ (Dev. Version)
 - User interface
 - Battery management
- Software »» In progress...
 - User interface's PIC18F2580
- Housing and mechanical integration of the hardware

Up-coming steps

- Software : LCD + Battery monitoring + Interface + compatibility with all the robots
- Housing and mechanical integration : choice of case + new PCB + integration

Up-coming steps : Housing



Up-coming steps : Housing



Questions

Thank you for your attention